

CLAIMS

1. A robot apparatus to be mounted on a robot hub, the robot apparatus comprising:
 - 5 a main robot link fixedly mounted to the robot hub;
 - a first robot extension arm rotatably mounted to a first end of the main robot link;
 - a second robot extension arm rotatably mounted to a second end of the main robot link, the first end of the main robot link being located on a distal end of the main
 - 10 robot link from the second end of the main robot link;
 - a first robot blade being mounted to the first robot extension arm;
 - a second robot blade being mounted to the second robot extension arm;
 - a hub motor providing controllable rotational motion of the main robot link about the robot hub;
 - 15 a first extension motor configured to provide controllable simultaneous extension or retraction of the first robot extension arm and the first robot blade; and
 - a second extension motor configured to provide controllable simultaneous extension or retraction of the second robot extension arm and the second robot blade.
- 20 2. The robot apparatus of claim 1, wherein the hub motor includes a stepper motor.
3. The robot apparatus of claim 1, wherein the hub motor includes an electro-mechanical motor.
- 25 4. The robot apparatus of claim 1, wherein the hub motor comprises one from the list of gear transmission system or friction transmission system.
5. The robot apparatus of claim 1, wherein the main robot linkage is a unitary structure.
- 30 6. The robot apparatus of claim 1, wherein each of the plurality of hub motor, first extension motor, and second extension motor are independently controllable.

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7. The robot apparatus of claim 1, wherein the first robot blade and the second robot blade are each configured to be inserted in a cell.
8. The robot apparatus of claim 1, further comprising a first pulley arrangement
- 5 that transfers output motion from the first extension motor to simultaneous angular rotation of the first extension arm and angular rotation of the second robot blade.
9. The robot apparatus of claim 8, wherein the first pulley arrangement provides for angular rotation of the first extension arm that occurs at a fixed rate compared to the
- 10 rate of the angular rotation of the second robot blade.
10. The robot apparatus of claim 8, wherein the first pulley arrangement provides for angular rotation of the first extension arm at a rate that is twice the rate of the angular rotation of the second robot blade.
- 15 11. A robot apparatus to be mounted on a robot hub, the robot apparatus comprising:
- a main robot link fixedly mounted to rotate about the robot hub;
 - a hub motor capable of providing controllable rotational motion to the main
 - 20 robot link about the robot hub;
 - a first extension hub being rotatably mounted to a first side of the main robot link;
 - a second extension hub being rotatably mounted to a second side of the main robot link, the second side being on an opposed side of the robot link from the first side;
 - 25 a first extension arm being mounted to the first extension hub;
 - a second extension arm being mounted to the first extension hub;
 - a first robot blade hub being rotatably mounted to a distal location of the first robot arm from the first extension hub;
 - a second robot blade hub being rotatably mounted to a distal location of the
 - 30 second robot arm from the second extension hub;
 - a first robot blade mounted to the first robot blade hub;
 - a second robot blade mounted to the second robot blade hub;

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a first extension motor configured to provide a first controllable simultaneous extension or a first controllable simultaneous retraction of the first extension arm about the first extension hub and the first robot blades about the first robot blade hub; and

- a second extension motor configured to provide a second controllable
5 simultaneous extension or a second controllable simultaneous retraction of the second extension arm about the second extension hub and the second robot blades about the second robot blade hub.

12. The robot apparatus of claim 11, wherein the second controllable simultaneous
10 extension or the second controllable simultaneous retraction occurs respectively independently of the first controllable simultaneous extension or the first controllable simultaneous retraction

13. The robot apparatus of claim 11, wherein the second controllable simultaneous
15 extension or the second controllable simultaneous retraction occurs respectively dependently of said first controllable simultaneous retraction or the first controllable simultaneous extension.

14. The robot apparatus of claim 11, wherein the robot apparatus is designed to
20 insert the first robot blade or the second robot blade sequentially into a single process cell.

15. The robot apparatus of claim 11, wherein the hub motor includes a stepper
motor.

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16. The robot apparatus of claim 11, wherein the hub motor includes an electro-mechanical motor.

17. The robot apparatus of claim 11, wherein the hub motor comprises one from the
30 list of gear transmission system or friction transmission system.

18. The robot apparatus of claim 11, wherein the main robot linkage is a unitary structure.

19. The robot apparatus of claim 11, wherein each of the plurality of hub motor, first extension motor, and second extension motor are independently controllable.

5 20. The robot apparatus of claim 11, wherein the first robot blade and the second robot blade are each configured to be inserted in a cell.

21 The robot apparatus of claim 11, further comprising a first pulley arrangement that transfers output motion from the first extension motor to simultaneous angular
10 rotation of the first extension arm and angular rotation of the second robot blade.

22. The robot apparatus of claim 21, wherein the first pulley arrangement provides for angular rotation of the first extension arm that occurs at a fixed rate compared to the rate of the angular rotation of the second robot blade.

15 23. The robot apparatus of claim 21, wherein the first pulley arrangement provides for angular rotation of the first extension arm at a rate that is twice the rate of the angular rotation of the second robot blade.

20 24. A method of providing a robot motion to a dual-bladed robot including a main robot linkage, a first extension arm and a connected first robot blade displaceably mounted to a first side of the main robot linkage, and a second extension arm and a connected second robot blade displaceably mounted to a second side of the main robot linkage, the method comprising:

25 initially rotate the main robot link so the first extension arm and the first robot blade are in an initial aligned position with a first process cell, during the initial rotation both the first extension arm and the first robot blade remain in their retracted positions;
continue rotation of the main robot link to insert the first robot blade in the first process cell, during the continued rotation the first extension arm and the first robot
30 blade simultaneously extend into their respective extended positions.

25. The method of claim 24, wherein an opening of the first process cell is aligned with the dual bladed robot.

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26. The method of claim 24, wherein an opening of the first process cell is offset from the dual bladed robot.

5 27. The method of claim 24, wherein when the main robot link, the first extension arm, and the first robot blade are fully rotated into their respective extended positions with the main robot link aligned with the first process cell, the first robot blade is inserted the first process cell.

10 28. The method of claim 24, wherein: during the initial rotation of the main robot link, the second extension arm and the second robot blade are in an initial aligned position with a second process cell, during the initial rotation both the second extension arm and the second robot blade remain in their retracted positions; and
during the continued rotation the second extension arm and the second robot
15 blade simultaneously extend into their respective extended positions.

29. The method of claim 24, wherein when the main robot link, the second extension arm, and the second robot blade are fully rotated into their respective extended positions when the main robot link is aligned with the second process cell, the second robot blade
20 is inserted into the second process cell.

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